

COMPARISON OF BRAIN METABOLITE CHANGES IN MANGANESE-EXPOSED WELDERS AND SMELTERS

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ABSTRACT

Excessive manganese (Mn) exposure is known to cause cognitive, psychiatric and motor deficits. Mn overexposure occurs in different occupational settings, where the type and level of exposure may vary. Magnetic resonance imaging (MRI) and spectroscopy (MRS) can be used to evaluate brain Mn accumulation and to measure Mn-induced metabolite changes non-invasively. The aim of this study was to compare metabolite changes among different brain regions of welders and smelters following occupational Mn exposure. Nine Mn-exposed smelters, 14 Mn-exposed welders and 23 male matched controls were recruited from a cohort of workers from two factories in China (mean airborne Mn level: 0.227 and 0.025 mg/m³ for smelters and welders, respectively). Short-echo-time 1H MRS spectra were acquired in each subject from four volumes of interest: the frontal cortex, posterior cingulate cortex, hippocampus, and thalamus. We found that 1) in the frontal cortex, significantly decreased creatine (Cr), glutamate (Glu) and glutathione (GSH) were found in welders, whereas decreased Glu was found in smelters as compared to controls. 2) In the thalamus, reduced myo-inositol was found in both smelters and welders, while Glu and GSH were decreased in welders. These results suggest that Mn-induced brain metabolite changes may be regional in nature and more extensive in welders than in smelters. The frontal cortex seems to show a more profound change than the other brain areas tested among Mn exposed subjects. Further studies are needed to investigate the effects of exposure type and length on the mechanism of Mn neurotoxicity. (Supported by NIH/NIEHS R21 ES-017498, National Science Foundation of China Grant #81072320 and 30760210).